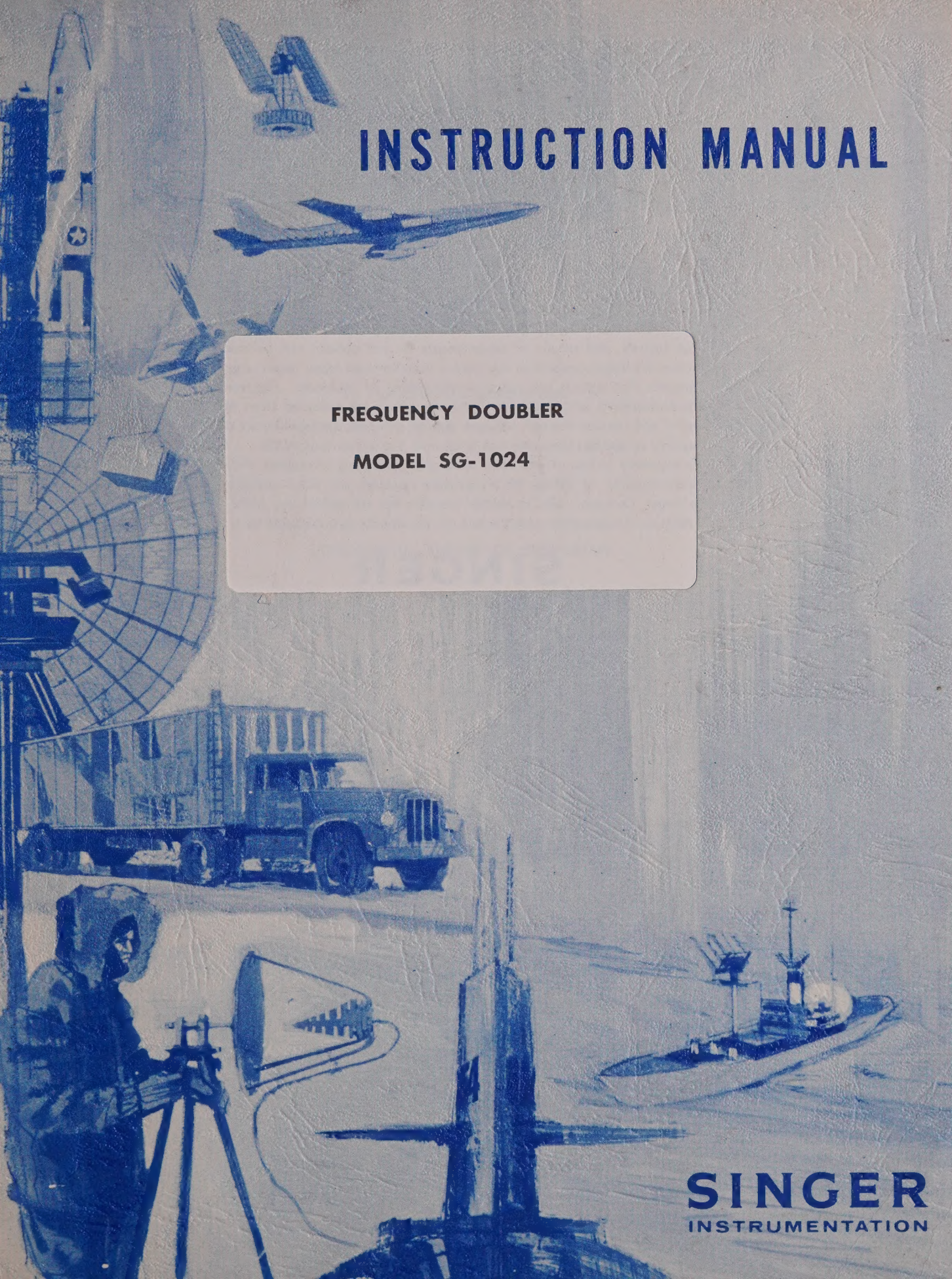
INSTRUCTION MANUAL



FREQUENCY DOUBLER

MODEL SG-1024

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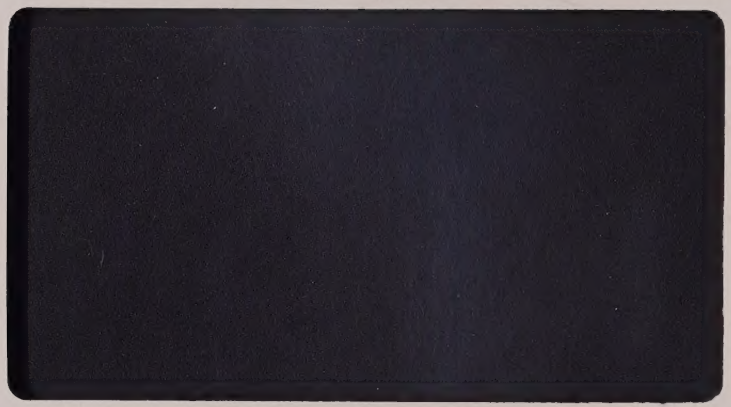

INSTRUCTION MANUAL

FREQUENCY DOUBLER

MODEL SG-1024

Serial No.

Instruction Manual No. 110-5098

SINGER
INSTRUMENTATION

THE SINGER COMPANY • ELECTRONIC PRODUCTS DIVISION

Creative Products for Test, Measurement, Analysis, Calibration

WARRANTY

THE SINGER COMPANY, ELECTRONIC PRODUCTS DIVISION, warrants each instrument sold by it to be free of defects in material and workmanship, effective from the date of shipment to the original purchaser for a period of 1 year except where a specific warranty period is stated in the operating manual.

The Seller will not be liable for incidental or consequential damages. The Seller's sole liability shall be repair, replacement, or return of purchase price at our option. Warranty returns first must be authorized by the factory, and repairs or replacements (at our option) will be made without charge for instruments returned freight prepaid to the factory or authorized repair depot when our examination satisfactorily indicates that defects are due to workmanship or materials. Electron tubes, batteries, fuses, lamps, thermoelements and *Ratio Tran* potentiometers are excluded from Warranty coverage. If the instrument or any portion thereof, has been abused, misused, damaged by accident or negligence, or if any serial number or seal has been removed or altered, this warranty is VOID.

This warranty is expressly in lieu of any other warranties expressed or implied, including any implied warranty of merchantability, or fitness for a particular purpose, any other obligations or liability on the part of The Singer Company, and it neither assumes nor authorizes any other person to assume for it any other liability in connection with the sale of instruments manufactured by it.

SINGER
INSTRUMENTATION

The Singer Company, Electronic Products Division
250 Crossways Park Drive, Woodbury, Long Island, New York 11797
Telephone: (516) 921-9400 TWX: 510-221-2121

REPAIR AND MAINTENANCE

Instruments should be returned only on prior written authorization from the Singer Representative or the factory(1) Warranty repair will be made upon written request. Please provide the following information in order to expedite our processing of your instrument:

1. Model or Type
2. Serial Number
3. Approximate date instrument was placed in operation
4. Approximate number of hours of use
5. Description of trouble(2)
6. Has maintenance action been previously requested?
7. Other comments

Upon receipt of this information our Service Department will send you service data or shipping instructions. Upon receipt of shipping instructions forward the instrument prepaid to the specified center or factory. If requested, an estimate of charges will be made before work begins.

(1) Contact East Coast Service Center, 250 Crossways Park Drive, Woodbury, Long Island, New York 11797, Telephone: (516) 921-5070, -5071 or West Coast Service Center, 3211 S. LaCienega Blvd., Los Angeles, California 90016, Telephone (213) 839-2201 for SINGER/Instrumentation equipment.

(2) Include data on symptoms, measurements taken, test instruments used, suspected location of trouble, maintenance action taken, and any other relevant data.

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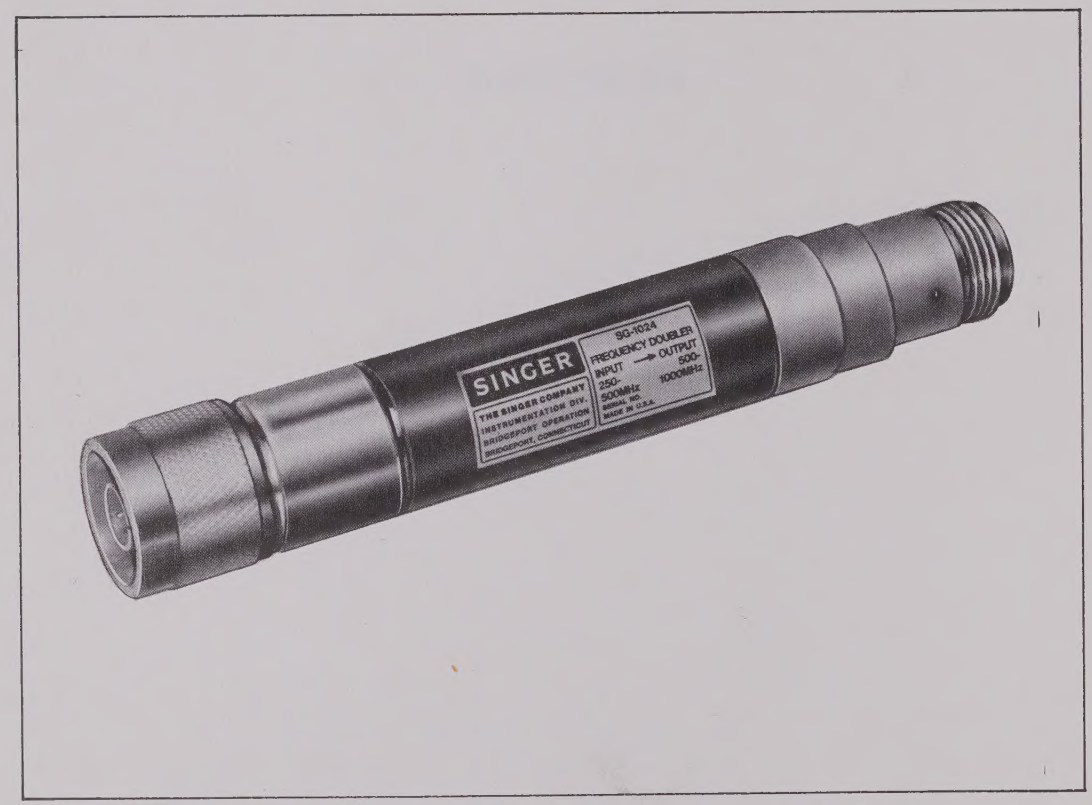

Figure 1-1. Model SG-1024 Frequency Doubler

SECTION I
INTRODUCTION

1-1. SCOPE OF MANUAL.

1-2. This instruction manual provides general information, theory of operation, maintenance information, schematic diagram and parts list for the Model SG-1024 Frequency Doubler.

1-3. The information contained in this handbook refers to the standard Model SG-1024 Frequency Doubler. Differences in equipment configuration, components, specifications or performance resulting from customer's application requirements and/or The Singer Company's continuous product improvement program are described in addendum sheets.

1-4. GENERAL DESCRIPTION.

1-5. The Model SG-1024 Frequency Doubler extends the upper frequency limit of the Model SG-1000 Signal Generator from 512 MHz to 1024 MHz.

1-6. The Frequency Doubler employs a full-wave balanced circuit with hot-carrier diodes and a coaxial transmission line transformer. It generates twice the applied frequency, while suppressing the fundamental and all odd-order harmonics.

1-7. Pulse and FM modulation are preserved with the same or better quality as in the SG-1000 and AM modulation is impaired only at large percentage modulations.

1-8. EQUIPMENT SUPPLIED.

1-9. The Frequency Doubler is shipped complete and is ready for use upon receipt.

1-10. SPECIFICATIONS.

1-11. The electrical and physical characteristics of the Frequency Doubler are listed in table 1-1.

TABLE 1-1. SPECIFICATIONS

Parameter	Specification
FREQUENCY DOUBLER OPERATION	
Frequency Range:	
Input	248 to 512 MHz
Output	496 to 1024 MHz
RF Output (SG-1000 set for +20 dBm):	
Conversion Loss	16 dB nominal
Frequency Response Flatness	±0.8 dB variation
Fundamental Suppression	Typically 20 dB
Odd-Order Harmonic Suppression	Typically 30 dB
GENERAL	
Input Connector	Type "N" male
Output Connector	Type "N" female
Dimensions	3/4" dia. x 4-11/16" L.

SECTION II
OPERATION

2-1. GENERAL.

2-2. This section contains instructions for installation and operation of the Frequency Doubler.

2-3. INSTALLATION.

2-4. The Frequency Doubler is shipped complete and is ready for use upon receipt. The Frequency Doubler, when ordered with the SG-1000 Signal Generator, is shipped in the same package. After the equipment has been unpacked, check the contents of all shipping containers against the packing invoice to ascertain that the order is complete.

2-5. INSPECTION. Examine the equipment for indications of damage which may have occurred during shipment.

2-6. MOUNTING. The Frequency Doubler is connected to the SG-1000 Signal Generator at the RF OUT jack.

CAUTION

WHEN NOT IN USE, THE FREQUENCY DOUBLER SHOULD BE REMOVED FROM THE SG-1000 SIGNAL GENERATOR.

SECTION III
THEORY OF OPERATION

3-1. GENERAL.

3-2. The Frequency Doubler is an accessory item for use with the SG-1000 Signal Generator. In operation, the doubler extends the upper frequency limit of the Model SG-1000 Signal Generator from 512 MHz to 1024 MHz.

3-3. DETAILED THEORY OF OPERATION. (See Figure 5-1).

3-4. Precision resistors R1, R2 and R3 provide isolation between the Frequency Doubler and the SG-1000 Signal Generator.

3-5. Two coaxial lines, one with three ferrite leads on it, form a coaxial balun. The transformer action of the balun and a pair of matched hot-carrier diodes, CR1 and CR2, operate as a full-wave rectifier to double the input frequency with high fidelity and low conversion loss.

SECTION IV
MAINTENANCE

4-1. GENERAL.

4-2. This section contains maintenance instructions for the Frequency Doubler. Included is a list of test equipment and performance standards checks to evaluate doubler operation within the published specifications.

4-3. TEST EQUIPMENT REQUIRED.

4-4. Test equipment required for checking and maintaining the Frequency Doubler is listed in table 4-1.

TABLE 4-1. TEST EQUIPMENT REQUIRED

Manufacturer	Model
The Singer Company	Signal Generator SG-1000
The Singer Company	Microwave Spectrum Analyzer SPA-3000
General Microwave	454A Power Meter

4-5. PERFORMANCE STANDARDS CHECK.

4-6. The performance standards check presented in table 4-2 is an aid to evaluate Frequency Doubler operation within the specifications listed in table 1-1. If the "Acceptable Indication" specified is not obtained, the Frequency Doubler is not functioning properly and the applicable corrective measure should be taken.

4-7. COMPONENT LOCATIONS.

4-8. The locations of components of the Frequency Doubler are illustrated in figure 4-1.

TABLE 4-2. PERFORMANCE STANDARDS CHECK

Step	Purpose	Procedure	Acceptable Indication
1	To evaluate frequency response	a. Connect SG-1024 to SG-1000 RF output jack. b. Connect Power Meter through 10 dB attenuator to SG-1024. c. Set SG-1000 output attenuator to +20 dBm, CW function. d. Set SG-1000 band switch to 248-512 MHz band. e. Set Power Meter to 0 dBm. f. Tune SG-1000 from 248 to 512 MHz. g. Note highest and lowest reading on power meter.	g. 1.6 dB overall variation. NOTE: If either CR1 or CR2 is defective, replace both with a matched pair.
2	To evaluate frequency suppression	a. Connect SG-1024 to SG-1000 RF output jack. b. Connect SPA-3000 through 10 dB attenuator to SG-1024. c. Set SPA-3000 controls as follows: 1 Set RF attenuator to 10 dB. 2 Set frequency dispersion to 300 MHz/div. 3 Select band #1. 4 Set amplitude scale to LOG. d. Set SG-1000 output attenuator to +20 dBm, CW function. e. Set SG-1000 band switch to 248-512 MHz band. f. Tune SG-1000 from 248 to 512 MHz. g. Note worst case fundamental and third harmonic.	g. Fundamental typically 20 dB; harnomics typically 30 dB. NOTE: If either CR1 or CR2 is defective, replace both with a matched pair.

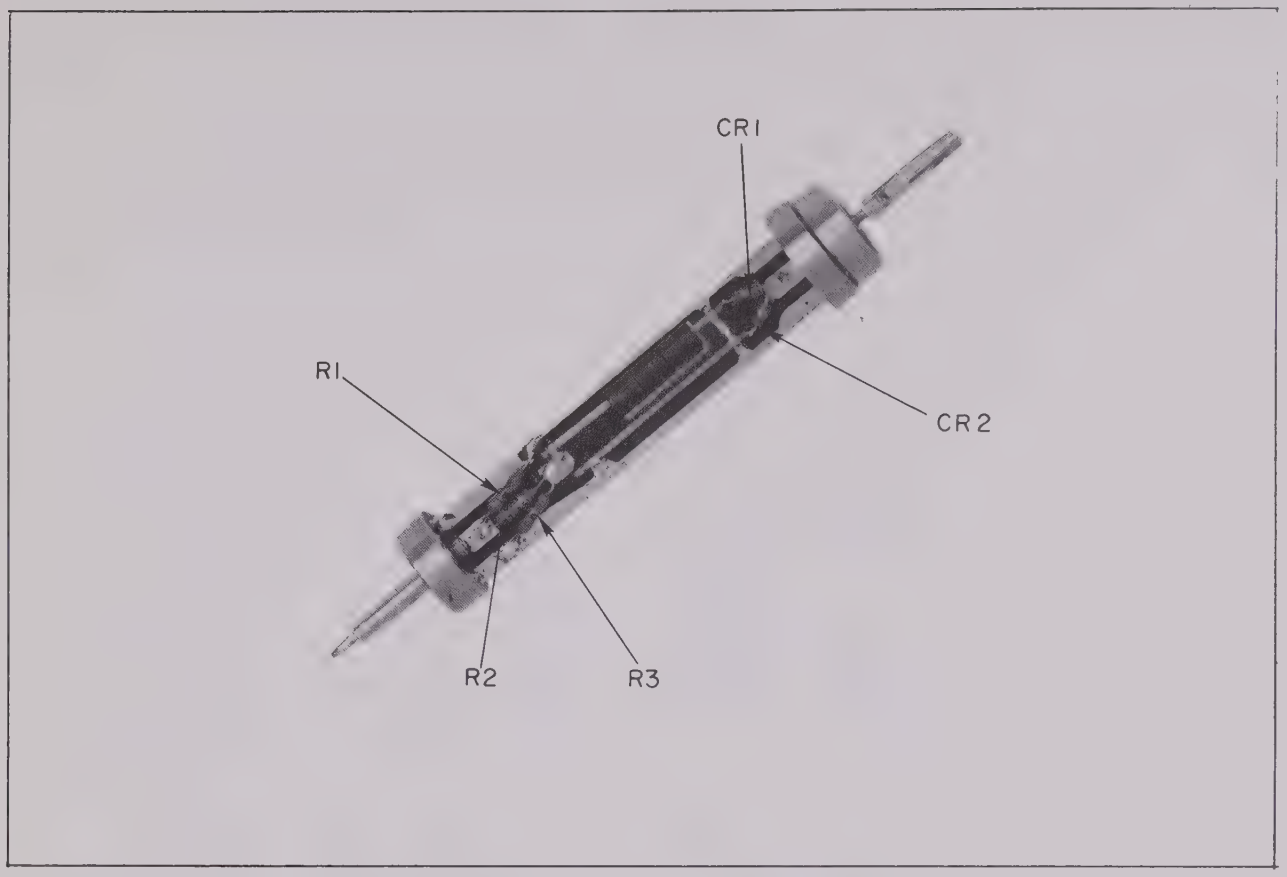

Figure 4-1. SG-1024 Component Location

SECTION V
SCHEMATIC DIAGRAM

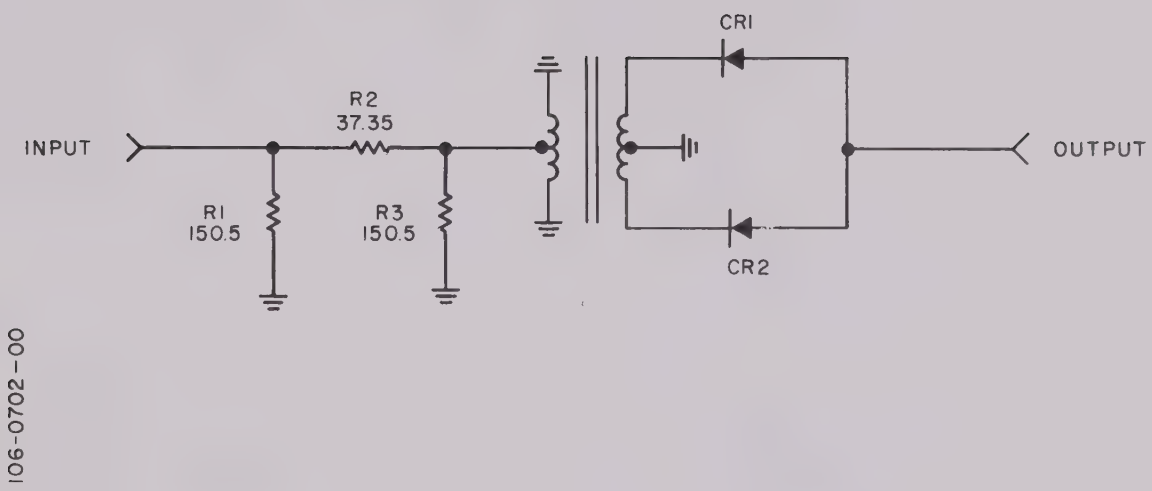

Figure 5-1. Model SG-1024 Frequency Doubler Schematic Diagram

SECTION VI
PARTS LIST

6-1. INTRODUCTION.

6-2. This parts list section includes all pertinent data necessary to locate, identify, and procure additional parts for the equipment. Parts are listed alpha-numerically by reference symbol and include all replaceable items such as electronic, electromechanical, and mechanical parts of the equipment. In some cases, values, ratings and manufacturer sources shown are nominal and variations may be found. Satisfactory replacement may be made with either the listed component or an exact replacement of the part(s) removed from the equipment.

6-3. ORDERING INFORMATION.

6-4. The following instructions will aid in ordering parts from the Parts List, tables 6-2 through 6-7.

a. Address all inquiries or orders to:

CUSTOMER SERVICE
Department 50
The Singer Company
Electronic Products Division
915 Pembroke Street
Bridgeport, Connecticut 06608

b. Include the following information:

1) Model and Serial Number of instrument.

2) Singer Part Number.

3) Reference Symbol Number.

4) Description (as shown on list)

6-5. HOW TO USE THE PARTS LIST.

6-6. Paragraphs 6-7 through 6-11 describe the use and meaning of the five columns included in the parts list (see figure 6-1).

6-7. REF SYMBOL COLUMN. The Ref Symbol Column (1, figure 6-1) contains a alpha-numerical listing of parts as they appear on equipment chassis, illustration, or schematic. The reference designation identifies the parts as to their component function in the instrument.

6-8. DESCRIPTION COLUMN. The Description Column (2, figure 6-1) contains the identification of component parts including all pertinent specifications and Singer part number. When the description column is used for a part which is identical to a part which has already been described: SAME AS (3) is used along with the reference symbol of the previously used part. In these instances, columns 3, 4, 5, are left blank.

6-9. MANUFACTURER'S PART NUMBER COLUMN. The Manufacturer's Part Number Column (5, figure 6-1) contains the part number as designated by the manufacturer of the part.

6-10. MFR'S CODE COLUMN. The Mfr's Code column (6, figure 6-1) references the manufacturer by an assigned code number as listed in Federal Supply Code Handbook H4-2. For manufacturers not listed in H4-2, a letter code will be assigned. Table 6-1 includes the manufacturer and his code designation.

6-11. MAINT QTY COLUMN. The Maint Qty column (7, figure 6-1) contains the number of additional components recommended to keep the equipment at an optimum performance level. The recommended number of components in the Maint Qty column is based on 2000 hours of equipment operation.

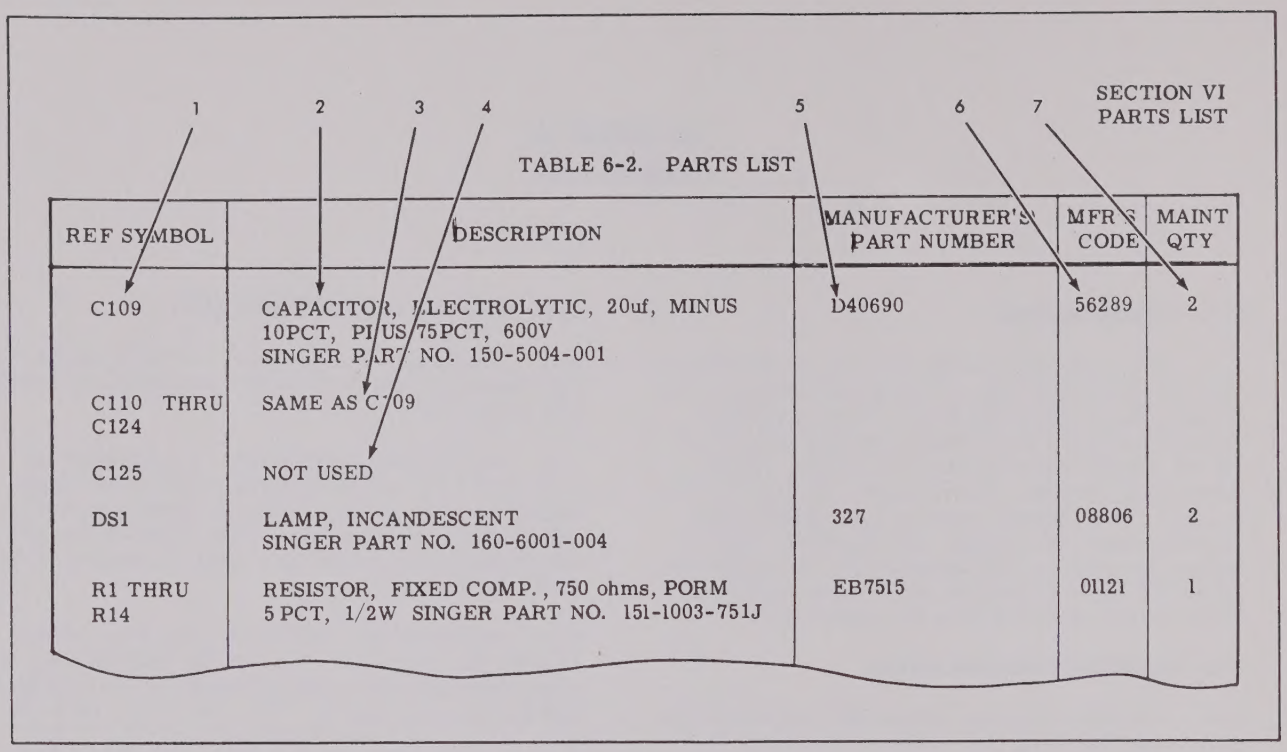

Figure 6-1. Parts List Sample

TABLE 6-1. MANUFACTURER'S CODE

Number	Name	Number	Name
13327	Solitron Devices Inc. Tappan, N.Y.	91737	Gremar Mfg. Co., Inc. Wakefield, Mass
91637	Dale Electronics, Inc. Columbus, Nebr.	INSTD	Industry Standard

TABLE 6-2. PARTS LIST

Ref Symbol	Description	Manufacturer's Part Number	Mfr's Code	Maint Qty
CR1 AND CR2	DIODE, MATCHED PAIR, 0.1 PF MAX AT 1 MHz, Vfwd 0 TO 10 mA, 5 mV MAX, SILICON PLATINUM JUNCTION SINGER PART NO. 154-0010-001	MSP10-10-05-4	13327	1
J1	CONNECTOR, JACK, CABLE, N SERIES COAX. FOR RG-5/U CABLE SINGER PART NO. 168-4049-001	UG-20C/U	91737	1
P1	CONNECTOR, PLUG, N SERIES COAX. FOR RG-5/U CABLE SINGER PART NO. 168-4050-001	UG-18E/U	INSTD	1
R1	RESISTOR, CARBON FILM, 150.5 OHMS, 1/10 WATT, PORM 1 PCT, NON-HELIXED SINGER PART NO. 556204-020	DC-1/10-150.5PORM 1PCT-NH	91637	1
R2	RESISTOR, CARBON FILM, 37.35 OHMS, 1/10 WATT, PORM 1 PCT, NON-HELIXED SINGER PART NO. 556204-006	DC 1/10-37.35PORM 1PCT-NH	91637	1
R3	SAME AS R1			